

$$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{x}} \right) = \frac{\partial L}{\partial x}, \quad \frac{d}{dt} \left(\frac{\partial L}{\partial \dot{y}} \right) = \frac{\partial L}{\partial y}, \quad \frac{d}{dt} \left(\frac{\partial L}{\partial \dot{z}} \right) = \frac{\partial L}{\partial z}$$

What is claimed is:

- 5 1. Isolated and purified mesenchymal progenitor cells that are
pluri-differentiated.
2. A therapeutic composition comprising an effective amount of
isolated and purified pluri-differentiated mesenchymal progenitor cells and a
10 pharmaceutically acceptable carrier.
3. The composition according to claim 2, wherein said pluri-
differentiated mesenchymal progenitor cells are present in an amount
effective to enhance bone marrow engraftment in a mammal in need thereof.
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4. The composition according to claim 2, wherein said pluri-
differentiated mesenchymal progenitor cells are present in an amount
effective to enhance hematopoietic progenitor cell engraftment in a mammal
in need thereof.
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5. The composition according to claim 2, wherein said pluri-
differentiated mesenchymal progenitor cells are present in an amount
effective to treat GvHD in a mammal about to undergo bone marrow or organ
transplantation or suffering from GvHD caused by bone marrow or organ
25 transplantation.
6. A method for purifying pluri-differentiated mesenchymal
progenitor cells comprising the steps of:
- 30 a) providing a cell culture preparation by the Dexter method;
b) treating the cells to obtain a cell suspension;
c) removing macrophages;
d) fractionating the cells; and

e) collecting the fraction of pluri-differentiated mesenchymal progenitor cells.

7. A method for enhancing bone marrow engraftment in a mammal
5 in need thereof which comprises the step of administering to the mammal (i)
isolated pluri-differentiated mesenchymal progenitor cells and (ii) a bone
marrow graft, wherein the isolated pluri-differentiated mesenchymal progenitor
cells are administered in an amount effective to promote engraftment of the
bone marrow in the mammal.

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8. The method according to claim 6, wherein said administering
step includes intravenously injecting or directly injecting the isolated pluri-
differentiated mesenchymal progenitor cells to the site of intended activity.

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9. The method according to claim 6, wherein said administering
step includes administering to the mammal the isolated pluri-differentiated
mesenchymal progenitor cells prior to administering the bone marrow graft.

10. The method according to claim 6, further including introducing
20 wherein the isolated pluri-differentiated mesenchymal progenitor cells into the
mammal in a cell suspension also containing bone marrow graft cells.

11. A method for enhancing engraftment of hematopoietic
progenitor cells in a mammal in need thereof by administering to the mammal
25 (i) isolated pluri-differentiated mesenchymal progenitor cells and (ii)
hematopoietic progenitor cells, wherein the isolated pluri-differentiated
mesenchymal progenitor cells are administered in an amount effective to
promote engraftment of the hematopoietic progenitor cells in the mammal.

12. The method according to claim 10, wherein said administering
30 step includes intravenously injecting or directly injecting the isolated pluri-
differentiated mesenchymal progenitor cells to the site of intended activity.

13. The method according to claim **10** wherein said administering step includes administering the isolated pluri-differentiated mesenchymal progenitor cells to the mammal prior to administration of the hematopoietic progenitor cells.

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14. The method according to claim **10**, further including introducing the isolated pluri-differentiated mesenchymal progenitor cells into said mammal in a cell suspension also containing hematopoietic progenitor cells.

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15. A method for treating graft-versus-host disease (GvHD) in a mammal about to undergo bone marrow or organ transplantation or suffering from GvHD caused by bone marrow or organ transplantation, by administering to the mammal an effective amount of isolated pluri-differentiated mesenchymal progenitor cells.

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16. The method according to claim **14**, wherein the mammal is one about to undergo allogeneic bone marrow transplantation or is suffering from GvHD caused by allogeneic bone marrow transplantation.

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17. The method according to claim **14**, further including administering immunosuppressive drugs to the mammal.

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18. The method according to claim **14**, wherein said administering step includes intravenously injecting the isolated pluri-differentiated mesenchymal progenitor cells.

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19. The method according to claim **14**, wherein said administering step includes administering the isolated pluri-differentiated mesenchymal progenitor cells prior to bone marrow or organ transplantation.

20. A method for diagnosing a disease state comprising the steps of:

a) establishing gene expression patterns of normal state bone marrow derived isolated pluri-differentiated mesenchymal progenitor cells;

5 b) establishing gene expression patterns of various leukemic state bone marrow derived isolated pluri-differentiated mesenchymal progenitor cells;

c) identifying gene sets that are unique to a given state; and

d) comparing a profile of bone marrow derived isolated mesenchymal progenitor cell of unknown state to said gene sets.

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21. A method for identifying therapeutic targets for treatment of hematopoietic function comprising the steps of:

15 a) determining the median gene expression profile of bone marrow isolated pluri-differentiated mesenchymal progenitor cells associated with each disease state of interest;

b) identifying gene groups that are up-regulated, down regulated, and common to each disease state; and

c) identifying gene sets that are unique to a given state.

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